

same condition tended to abnormal heat in the Southeast. The solution of this problem is to be sought in the upper atmosphere. The clear, dry air of the Northwest permitted intense heat radiation to the sky, and day after day this was maintained without the interference of moist lows from the Pacific. In other words, we have here an excellent example of the intense radiation-cold experienced in Siberia in the stagnant high pressure of that region, sometimes reaching

31.70 inches. On the other hand the moister air of the Southeast permitted the heat of the low latitude sun to penetrate to the earth, and after the heat reached the earth the moisture prevented its radiation into space. The most important point in this whole discussion is the sharp distinction to be drawn between a radiation-cold, pure and simple, and the cold of our cold waves advancing across the country at 40 and more miles per hour.

NOTES BY THE EDITOR.

SIMULTANEOUS BALLOON ASCENSIONS.

The recent International Meteorological Conference at Paris indorsed the importance of cooperation between the governments and individuals who are now so enthusiastically prosecuting the exploration of the atmosphere and the study of meteorology with the help of the balloon. Perhaps the most important point upon which these can unite is the attempt to secure approximate simultaneity in their ascensions. As the exploring balloon may be sent up without any passengers or aeronauts, but may carry accurate self-recording instruments into regions and temperatures that are inaccessible to man, there is nothing impracticable in the proposal that ascensions be made on any given day at many places over a wide extent of country, so as to give us a general view or possibly a detailed map of the condition of the upper air at that time. Such a series of simultaneous ascensions will undoubtedly frequently be made from European stations, under the general guidance of the special committee on aeronautics recently appointed by the Paris Conference, and in a spirit of scientific cooperation, rather than of national or personal rivalry. Such work was begun by the *Deutscher Verein zur Förderung der Luftschiffahrt*, in Berlin, in 1894, and the first results are collected in a paper by Assmann in the *Zeitschrift für Luftschiffahrt*, XXIV. The first simultaneous ascensions were made from Berlin and St. Petersburg, August 4, and the second, August 9, 1894. A third set, of three ascensions, was made October 1, from St. Petersburg, Warsaw, and Ossowicz. Meantime, in September, 1894, three balloons, the *Phoenix*, *Majestic*, and the unmanned exploring balloon *Cirrus*, with self-registering apparatus, made a simultaneous ascension on the 6th, and as soon as practicable after that the *Majestic* made a long voyage through the night of the 5th and the daytime of the 6th of October. On December 4 Berson ascended from Stassfurt and descended at Kiel.

The ascensions made November 14, 1896, may be considered as the beginning of a long series of similar international investigations of the atmosphere by means of simultaneous balloon ascensions covering all of Europe. On that date the lowest temperatures observed and the greatest heights attained by balloons at different localities were as follows:

| Place. | Height. | Temperature. | Remarks. |
|------------------|----------------|--------------|---|
| | <i>Meters.</i> | <i>° C.</i> | |
| St. Petersburg.. | 5,000 | -24 | -27.5° at 4,300 meters. |
| Warsaw | 2,000 | -20 | |
| Berlin | 6,000 | -25.6 | Warm air below 3,000 meters. -30.0° at 6,000 meters. |
| Do. | 5,650 | -24.4 | |
| Strasbourg | 7,700 | -30 | |
| Paris | 15,000 | -60 | |
| Munich | 3,500 | -6.5 | |

The above observations represent the conditions prevailing in the midst of a large area of high pressure that was moving slowly eastward over Europe. At Strasbourg and Berlin a layer of warmer air was noted before ascending into the colder air above. On the 14th, 7 a. m., the central isobar of

765 millimeters extended from Finland southward to Greece, and on the 14th, 9 p. m., the isobar of 770 millimeters extended from St. Petersburg south to Bulgaria. The sky was generally cloudless during these balloon ascensions, but cloudy weather soon followed with continued cold at the earth's surface and high pressure from France eastward to the Ural. To the north of this belt temperatures were not abnormally low. Evidently this ridge of 775 to 785 millimeters, extending southeast and northwest between two low areas, represented the slow descent of cold, dry air which flowed away in all directions near the earth's surface; the whole system of sea-level pressures and temperatures could have resulted from a general eastward movement and very slow descent of the layer of cold upper air that was reached by the balloons on the 14th; eventually, it disappeared in the southeast of Europe moving toward Persia. The temperature of a mass of slowly descending dry air follows the laws explained by the Editor in *American Meteorological Journal*, 1892, VIII, pp. 537-552.

The idea of these simultaneous ascensions seems to have been first urged in 1894 by Berson and Assmann, the assistants of von Bezold in Berlin, and was by them urged upon the attention of the Paris Conference, which voted to encourage such ascensions.

[It may be worth recording that the importance of utilizing simultaneous balloon ascensions and the defects to which our knowledge is subject as long as we neglect the use of the balloon were fully appreciated by the present Editor, who has not failed to urge the systematic scientific use of special balloon voyages and as early as 1871 entered upon his daily weather maps the records of the various ascensions made by professional aeronauts for business purposes; thus, on July 4, 1871, 1872, 1873, respectively, he was able to study the paths of from three to five balloon voyages.—Ed.]

In a recent letter from Berson to Hermite, as published in the *Aerophile* (Oct. 1896, p. 223), Berson corrects several errors which if uncorrected might discourage others from attempting similar work. He says:

1. All the high ascensions of the balloon "*Cirrus*" from Berlin, so far as they have been published, have been made with ordinary illuminating gas and not with hydrogen; with this gas a height of 18,300 meters has been attained (this altitude is computed after making careful allowance for the temperature of the air and the barometric errors) the great altitudes attained by the "*Cirrus*" are to be attributed only to the dimensions of the balloon, whose volume is 250 cubic meters.

2. The voyages of the "*Cirrus*" had nothing whatever to do with the Industrial Exposition of the City of Berlin; they were not for show or sensation but were a part of the systematic work undertaken by the aeronauts and meteorologists of Berlin with the assistance of the German Government and, especially, of the Emperor in person.

3. The German balloon "*Cirrus*" has not yet been furnished with apparatus suitable for bringing down specimens of the upper air for chemical analysis but has been confined hitherto by Mr. Assmann, to the determination of temperature, pressure, and wind for which purposes the most exact methods have been used.

[As the examination of the moisture contained in a specimen of air brought down from the highest regions would be an admirable check upon any record made by a self-register-

ing hygrometer there is an additional meteorological reason for securing such specimens.—Ed.]

4. For high ascensions by aeronauts in person, the Germans have adopted the method of breathing pure oxygen enclosed under a pressure of 150 atmospheres within a steel tube, as being much preferable to Paul Bert's method of carrying a mixture of 30 per cent of oxygen in a gas bag at ordinary pressures. They consider the breathing of pure oxygen a matter of primary importance in such ascensions.

It is well known in America that our own veteran aeronaut, Prof. S. A. King of Philadelphia, has during his life-long experience never failed to urge the importance of balloon ascensions to the meteorologist. In 1871, he in connection with the present writer, laid before the Chief Signal Officer a report recommending that telegraphic stations send up small free balloons in order to ascertain by simultaneous ascents the general direction and velocity of the wind for 1,000 feet above the ground. Although this proposition was not accepted, yet a beginning was made in the utilization of the balloon for meteorological purposes and the following account of the work of the Signal Service is corrected from Bulletin 11, Part 2, p. 275, Report of the International Meteorological Congress held at Chicago, August, 1893:

Through the enthusiastic cooperation of Prof. King the Signal Service was subsequently enabled, at slight expense, to send observers on aerial voyages, as follows: 1872, Mr. Schaeffer ascended with Mr. King from Rochester, N. Y.; 1877, Mr. Ford went up at Nashville, Tenn., on April 3, June 18 and 19; 1881, September 12, Mr. Upton went up from Minneapolis, Minn., and a few weeks later Mr. Hass-Hagen ascended from Chicago. In 1885 an arrangement was made with Professor King by which a number of ascensions were to be made from Philadelphia, Pa., whenever ordered by General Hazen. In accordance with this plan five ascents were made, four of them in the special interest of meteorology, with Mr. W. H. Hammon as observer, and the last one in the special interest of military signaling and balloon photography. Through the kindness of another aeronaut, Mr. Allen, similar privileges were by him accorded to Professor Hazen, who has made several ascensions. The valuable results of all these latter aerial voyages have been published in the American Meteorological Journal.

The recognition thus given, ever since the voyages of Gay Lussac and Glaisher, to the important data that meteorology may obtain by cooperation with aeronauts has been followed by the development of a growing interest in the subject. As the large balloons manned by at least one aeronaut and one observer required a large outlay of money and time, and as such ascensions can not be made in our very coldest weather, nor during high winds, and with difficulty during rain or snow, and as many observers can not ascend above 25,000 feet without increasing inconvenience and even danger, there is every incentive to develop meteorological aeronautics along the line of activity which was initiated by Berson and Hermite, and has been most successfully pushed by Hergesell and Assmann. In the MONTHLY WEATHER REVIEW for November, 1894, p. 507, will be found some details of the remarkable ascensions made by Dr. A. Berson on December 4, from Berlin; he attained the height of 30,000 feet and the observations made by him were of great value. This represents the very best that has been done by personal ascension. On the other hand the unmanned balloon "Cirrus" from Berlin, attained 55,000 feet, September 6, 1894, and in the MONTHLY WEATHER REVIEW for January, 1896, p. 16, there will be found an account of the ascension near Paris of a small balloon, the "Aerophile," without personal attendant, carrying only a light piece of self-registering apparatus. Two such voyages are there mentioned, that of October 20, 1895, which attained over 50,000 feet, and that of March 27, 1896, which attained 43,000 feet. Science owes a debt of gratitude to Assmann and Berson of Berlin, and MM. Gustave Hermite and Georges Besancon of Paris, who invented the apparatus and carried out these experiments. It is in this line of work that observational meteorology is now to make its next great advances. The photography of the earth, as seen from the balloon, a matter that has recently been

much discussed in New York City, has been practiced by the French aeronauts for many years, beginning with Triboulet in 1876, and recently they have added even the photography of clouds. A splendid series of photographs of Philadelphia and its environs was taken by Prof. S. A. King and assistants in 1885.

THE FRANKLIN KITE CLUB.

We have on several occasions published in the MONTHLY WEATHER REVIEW such items as we could gather relative to the Franklin Kite Club of Philadelphia, which seems to have been the most systematic effort as yet made to develop the kite for meteorological purposes. Quite recently Mr. William J. Rhees, who was for many years Chief Clerk of the Smithsonian Institution under Professors Henry and Baird, informed us that he had obtained an interesting item in connection with the life of the late William B. Taylor, who was born in 1821 in Philadelphia, but for over forty years was well known as one of the most learned and able of the scientific men employed in the Patent Office and the Smithsonian Institution.

Mr. Rhees kindly communicates the following abstract from his unpublished manuscript memoir of Mr. Taylor:

While attending school in the winter of 1835-36, Taylor lived with an aunt, who was the matron of the Philadelphia City Hospital (at Schuylkill, Fourth and Coates streets). This hospital was in the middle of a large lot surrounded by a fence, but free from trees or other obstructions.

In 1835-36 several gentlemen formed a society with the name of "The Franklin Kite Club," for the purpose of making electrical experiments. For a considerable time they met once a week at the City Hospital grounds and flew their kites. These were generally square in shape, made of muslin or silk, stretched over a framework of cane reeds, varying in size from 6 feet upward, some being 20 feet square. For flying the kites, annealed copper wire was used, wound upon a heavy reel 2 or 3 feet in diameter, insulated by being placed on glass supports. When one kite was up sometimes a number of others would be sent upon the same string. The reel being inside the fence the wire from the kite crossed over the road. Upon one occasion as a cartman passed, gazing at the kites he stopped directly under the wire and was told to catch hold of it and see how hard it pulled. In order to reach it he stood up on his cart, putting one foot on the horse's back. When he touched the wire the shock went through him, as also the horse, causing the latter to jump and the man to turn a somersault, much to the amusement of the lookers on, among whom was Taylor.

It was this incident and others of a similar character connected with the Kite Club, that turned his youthful mind to science and especially to electrical phenomena.

THE USE OF THE KITE IN METEOROLOGY.

For many years the Editor has been collecting the literature relative to the use of the kite in meteorology, and this collection has been freely used in the writings of Prof. C. F. Marvin and Mr. A. L. Rotch. In a review of this subject by Mr. A. Lancaster, in *Ciel et Terre*, he calls attention to the work of Mr. W. R. Birt and Sir Francis Ronalds, who in 1847 organized a series of experiments at the Kew Observatory, an account of which is given in the London, Edinburgh, and Dublin Philosophical Magazine, September, 1847 (3), XXXI, p. 191, and as the short article is but little known, we reproduce it as follows:

Mr. W. R. Birt (on the 14th of this month, August, 1847) took some kites, etc., to the Kew Observatory, for the purpose of endeavoring to ascertain how far it might be practicable to measure the force of wind at various elevations by their means, and (in the mere manipulation of his experiments) was assisted by Mr. Ronalds. After several trials, etc., they agreed that the sudden variations, horizontal and vertical, in the position of the kite, the great difficulty of making a kite which should present and preserve a tolerable approximation to a plane, that of measuring with sufficient accuracy, at any required moment, its inclination, and lastly, the influence of the tail, would always tend to render the observation somewhat unsatisfactory. Mr. Ronalds then proposed to try the following method of retaining a kite in a quasi-invariable given position. Three cords were attached to an excellent hexagonal kite of Mr. Birt's construction; one in the usual manner, and one on each side (or wing). The kite was then raised as usual; the two lateral cords